


CERTIFICATE OF AUTHORSHIP/ORIGINALITY

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.


Signature of Student

DEVELOPING A LANGUAGE OF INTERACTIVITY THROUGH THE THEORY OF PLAY

BY ANDREW POLAINE
andy@polaine.com

STUDENT NO. 10131908

THESIS SUBMITTED FOR THE HIGHER DEGREE OF
DOCTOR OF PHILOSOPHY

SUPERVISOR: PROF. ROSS GIBSON

FACULTY OF ARTS AND SOCIAL SCIENCES
UNIVERSITY OF TECHNOLOGY, SYDNEY

ACKNOWLEDGEMENTS

Given the rather lonely task of writing a doctoral thesis it turns out there are a large number of people to thank.

The first thanks must go to my principal supervisor, Professor Ross Gibson, for his guidance and input throughout the process and for taking me on as his PhD student. He has been a stimulating sounding board for my ideas. Perhaps more importantly as an experienced writer he has given me a great deal of encouragement and guidance in the process of telling the story of those ideas. He has always treated me as a peer and in the darker moments of the writing journey he guided me to the light at the end of the dissertation. Without this the document in your hands would have joined the many other unfinished pieces of work languishing in the dungeons of my hard drive.

I am very grateful to the members of UTS's Creativity and Cognition studios under the guidance of Professor Ernest Edmonds, in particular Lizzie Muller, who was instrumental in getting my *Time Sketches* work into *beta_space*, and Brigid Costello who unfathomably took on the task of interviewing the participants whilst I was out of the country. Their own research mirrored much of mine and the rigor of our conversations along with other members of the studio's "Pub Club" helped me refine my ideas. Greg Turner (Dr. Greg, no less) also helped me set up the work and took the excellent photos of the two boys playing that are used in this thesis. Thanks also go to David Low who proofread my thesis and thus generously provided me with hours of typo corrections [*sic*].

All the authors and researchers upon whose shoulders I have stood have my eternal gratitude and they will find their names in the absurdly long list of references at the end. Mark Pesce merits an individual mention for letting me steal the phrase "The Invitation to Play", which forms a central principle of this thesis. Thanks also to Mark Pesce and the other examiners, Prof. Anne Cranny-Francis and Dr. Melanie Swalwell who all provided generous and useful feedback and suggestions.

Thanks are due to my family and friends as well as my colleagues at Antirom – the environment that formed the foundation of my approach to interactivity – and the other studios in which I have worked. Thanks too to my colleagues at the College of Fine Arts, UNSW (who also provided the grant funding for *Time Sketches*) and the Bauhaus University in Weimar.

One of the chief sources of inspiration has been my students who continue to inspire me as well as being one of the most demanding and questioning audiences. They have unwittingly let me inflict my untested ideas on them and humoured me that I knew what I was talking about. The readers and commenters on my blog, Playpen, have been similarly gullible and generous, thank you.

Most importantly, immeasurable love and gratitude are due to my wife, Karin, who has put up with bouts of frustration, inordinate piles of books and long monologues from me for much longer than anyone should have to. She also pointed me towards much of the psychology literature contained in this thesis all whilst writing her own Masters dissertation. I am more than a little jealous that she started after me and finished before me.

It goes without saying that any errors and omissions are entirely due to someone else or my cats, Leo, Oskar and Archie who kept me company during the long hours at the computer and added their own input by walking over my keyboard. All the best bits are mine.

ABSTRACT

In a world increasingly influenced by interactive interfaces, devices and services both in the commercial and non-commercial spheres, understanding interactivity and its underpinnings is essential. We have moved into a state of flux in which both culture and technology are in constant interplay and the only constant is change itself. The only future-proof approach to designing for and dealing with an environment of constant change in these systems and forms is to look for a mechanism and theoretical framework that underpins them all.

Drawing upon a range of disciplines – from design, art, cognitive science, linguistics and more – this thesis argues that play is such a fundamental building block of culture, society, technology and cognition that it is the ideal lens through which to examine the interactive experience. It is versatile enough to cross boundaries and fundamental enough to be understood intuitively. Through an understanding of the intersection between movement, embodied cognition, metaphor and play, a set of principles of interactivity are developed that are flexible enough to analyse and be applied to a broad spectrum of interactive experiences, from interactive artworks to services to individual user interface elements. Finally, it is proposed that these principles provide a way to examine the phenomenal growth of social networks and the fundamental cultural shifts we are experiencing today as a result of the friction generated between emerging networked technologies and the industrial age structures they are dismantling.

CONTENTS

ACKNOWLEDGEMENTS	i
ABSTRACT	ii
PART I - PLAY, FLOW, METAPHOR & COGNITION	1
Introduction	1
What is interactivity?	6
Interactivity and the HCI field	10
Towards a language of interactivity	11
CHAPTER 1 - The Role of Play in Interactivity	13
Play as a design process, interactivity as content	14
Playful interaction and direct manipulation	17
Cameras and the body as affordance	20
CHAPTER 2 – Flow, Interactivity & Suspension of Disbelief	23
Interactive Flow versus Narrative Flow	23
Willing Suspension of Disbelief and Interactivity	25
CHAPTER 3 - Interactivity, Metaphors and the Mind	28
The role of metaphors	28
Interfaces are both metaphorical and physical	30
A metaphor too far	36
Direct control and manipulation in interfaces	40
CHAPTER 4 - Thinking Outside of the Brain	43
Scripts, Schemata, Mental Models and Automotive Action	43
Scripts	44
Schemata	47
The embodiment of AI	51
Pay no attention to that man behind the curtain	53
Are we automata?	54
Not today, I'm not in the mood	56
The Mojave Experiment	58
PART II - DEVELOPING THE PRINCIPLES OF INTERACTIVITY	63
CHAPTER 5 – The State of Play	63
Homo Ludens	63
Les Jeux et les Hommes	65
Love is... ..	75
From Physics Lab to Living Room to the Bus	77
Game Studies	82
The Magic Circle	89
CHAPTER 6 – Principle 1: The Invitation to Play	91
Form, function, medium and message	92
Case Study: Time Sketches	103
Case Study: Body Movies – public play and interaction	110

CHAPTER 7 – Principle 2: The Playing Field & the Rules	114
The Rules of Play	115
The Lusory Attitude	116
Using the lens of gameplay	118
We are all hackers	121
CHAPTER 8 – Principle 3: Challenge, Boredom and Anxiety	123
The border between boredom and anxiety	127
CHAPTER 9 – Principle 4: Triviality, Open-endedness, Promises	133
Playing in the Gallery	133
Delivering the promise	136
Case Study: Eavesdrop – an opportunity missed	140
CHAPTER 10 – Social Interaction and Playing with Friends	145
APIs as invitations	147
PART III - Conclusion	151
CHAPTER 11 - Understanding Interactivity Through Play	151
POSTSCRIPT	155
Social Play & Cultural Disruption	155
REFERENCES	162
Appendix A – Time Sketches Research Interview Instructions	176
Interview Questions	178
Appendix B – Time Sketches Research Interviews	180
Subject 1 - Interview	180
Subject 2 - Retrospective Report	182
Subject 2 - Interview	183
Subject 3 - Retrospective Report	185
Subject 3 - Interview	186
Subject 4 - Retrospective Report	188
Subject 4 - Interview	190
Subject 5 - Retrospective Report	193
Subject 5 - Interview	194
Subject 6 - Retrospective Report	196
Subject 6 - Interview	198
Subjects 7 & 8 - Retrospective Report	201
Subjects 7 & 8 - Interview	205

LIST OF FIGURES

Figure 1: Dan Saffer's definition of Interaction Design	4
Figure 2: A screenshot from the 1994 Antirom CD-ROM	15
Figure 3: The "Production" section of the Levi's kiosk	16
Figure 4: A simple 'soundspace' audio mixer from the Antirom CD-ROM	17
Figure 5: Rimbalzo by Fabrica	18
Figure 6: The 'Madness' opening screen of We Feel Fine	32
Figure 7: The 'Mounds' screen of We Feel Fine	33
Figure 8: The view-by-weather screen of We Feel Fine	34
Figure 9: The Bumptop Interface	37
Figure 10: Apple's Exposé in action	38
Figure 11: VisiCalc running in MS-DOS	41
Figure 12: The City Wall project in Helsinki	70
Figure 13: A Guitar Hero player striking a 'power stance'	71
Figure 14: Wii Sports players in action	71
Figure 15: Classification of games from Caillois, Man, Play and Games	72
Figure 16: Tennis for Two by William Higinbotham	78
Figure 17: Spacewar! running on the Computer History Museum's PDP-1	78
Figure 18: Tennis (Pong) on a 1975 German videogame console	79
Figure 19: SEGA's Super Monkey Ball game for the iPhone.	81
Figure 20: Antirom's Installation for the JAM exhibition	100
Figure 21: Time Smear	104
Figure 22: Detail of the Time Smear slice line indicator	105
Figure 23: Time Slicer	107
Figure 24: Time Slicer installed in beta_space	108
Figure 25: Rafael Lozano-Hemmer's Body Movies	110
Figure 26: Samuel van Hoogstraten's 1675 engraving, The Shadow Dance ...	111
Figure 27: Rafael Lozano-Hemmer's Body Movies	112
Figure 28: Tokyo Life	135
Figure 29: Dan Saffer's definition of Interaction Design	151
Figure 30: The interactive experience	152